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THE ANTHROPOGRAPHY OF SOME GREAT CITIES.

A STUDY IN DISTRIBUTION OF POPULATION.

BY

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The glamour that hangs about Imperial Rome is not strange in a world whose educated people have mostly had a touch of classical training. At any rate, students of the classics are willing to think of classic days as glorious days and of ancient Rome as the most glorious of cities. A part of this glory, it is commonly believed, lay in the great number of her inhabitants. Perhaps the attitude of historians is fairly reflected by Merivale:

> " On the whole, the computations alleged on all sides are little more than one guess against another; we may be content to strike a balance between the most plausible of several, and set our own figures at one million."†

At one time there was much argument about this matter, which seems to run back for the most part to a discussion in Gibbon's "Decline and Fall of the Roman Empire," with an estimate of 1,200,000 inhabitants. Of course, the only way to find the number of people in a city is to count them, but Gibbon's opinions were written about the time of the American Revolution, before the days of the modern scientific census. When our forefathers had won in battle the right to representative government, the census became necessary for the apportionment of the representatives among the people, so the first count on our continent was made in 1790. There was a census made in Sweden about 1750, but most of Europe began the work about 1800. Now it is necessary to recognize two facts in this connection: First, that at the time of Gibbon's estimate no cities out of Sweden had been accurately counted, so that scholars of that day had no facts about the size of cities before them, and second, that the counts made later showed clearly that there was then no city of a million people in the world, as far as accurate knowledge reached. There can be little advantage in dwelling on the size of Oriental cities that have never known a census. Yet in China we still find Peking estimated all the way from 700,000 to 2,000,000 inhabitants, by observers who are careful, conscientious and certainly better fitted to make an estimate than any ancient Roman could be, for they have lived in cities of known size that could serve them as a basis of comparison. All the ancient statements are indirect, but it is probable that if Cæsar and Cicero had both given us estimates of the size of the Rome they knew, the numbers would have differed widely and would have had little relation to actual facts. There is no way to ascertain the size of a city but by actual count. Modern data do, however, enable us to apply a criterion to estimates like these, a criterion that did not exist for Gibbon.

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* I have to acknowledge a deep obligation to the gentlemen who have spared no pains in collecting for me ward maps, data of area and general information about their cities: Mr. Ralph E. Blount, Chicago; Mr. Chas. W. Ammerman. St. Louis; Asst. City Engineer Frederic H. Fay, Boston; Mr. Henry E. Jefferson and Prof. W. S. Tower, Philadelphia; Dr. Ellsworth Huntington and Mr. Jacob Riis, New York, and Director North, of the United States Census, Mayors, and other officials of many cities have extended courtesies.—M. J.

† "General History of Rome," London, 1875, p. 676.

All the million-cities that we know to-day are very modern. They belong to the nineteenth century and the great industrial expansion which followed the introduction of steam as a motive power for industry and transportation. The first to attain that figure was London, in 1802, then Paris in 1850, New York in 1870, Vienna in 1878, Berlin in 1880, Tokio, Chicago and Philadelphia in 1890, Calcutta in 1900, and Buenos Aires in 1906.* The mind that dwells a little on these dates will not fail to be impressed with the great newness of this thing, the city with a million people, always provided that we keep on the safe ground of scientific census taking. The growth of these cities has accompanied the transfer of great masses of workers from agricultural to industrial occupations, a fact established by our census work in a way no ancient migration of people was ever established, nor any change in the habits and life of any people of old. We are not limited to records of observers' impressions, but we have made painstaking and costly measurements. There can be no question that our modern million-cities are a product of modern industry.

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* The dates are only approximate, since the census is only taken at recurrent epochs.

It appears likely, also, that they are in some measure a result of geographic conditions, for each of them lies at a natural concentration point on an agricultural lowland or basin, usually open to the sea. A glance at the relief map of Europe shows the north occupied by a great lowland plain between the British and Scandinavian uplands on the north and west, and the ridges that encompass and traverse the Mediterranean on the south. This plain is unequally divided between the foremost powers of Europe, Great Britain, France, Germany and Russia. Central on the British plain is London; on the French, Paris; on the German, Berlin; while Moscow, in the centre of the Russian plain, symbolizes the interior, land empire of Old Russia, and St. Petersburg suggests modern Russia's aspiration to take part in the affairs of the outer world. A little south of this northern plain, beyond the Saxon and Bohemian mountains and the Carpathians, lies the next greatest plain of the continent, that of Austria-Hungary, with Vienna at its western entrance. Buenos Aires is the commercial and cultural focus of the great plains of temperate South America, as Chicago is of the great plains of our continent. If Philadelphia and New York derive some of their significance from the coastal plains of the Atlantic, New York preponderates principally because easy water and rail communication with Chicago enables that, the country's greatest port, to share in the vigorous life of the continental interior. For India, a glance at the relief map shows a broad lowland strip sweeping along under the Himalayas from the mouth of the Ganges to that of the Indus. Why should Calcutta be the million-city rather than Karachi at the western end of the belt, one might ask? Because the rain falls and the people live at the other end. Nearly half the people of India—nearly as many as all the people of North America—live on that lowland between Calcutta and Delhi, in a strip little over 200 miles wide and 1,000 long. It is this enormous agricultural population, poverty-stricken though it be, that maintains Calcutta. Tokio in Japan lies on the streams that drain the greatest plain in the Empire, amid the densest population on the earth, if its large proportion of unproductive land is considered. And Tokio is laying the tribute of commerce on the lands beyond the sea nowadays just as London has done for two or three centuries. And the great cities of the plains owe their growth not so much to the goodness of the soil of plains as to the ease with which products, whether of farm or factory, are moved across them *in any direction.* In this regard the ocean is the great plain of the earth.

The huge manufacturing activities of these places cannot divorce them from the plains that Professor Penck has called their sustenance spaces. If many men have abandoned agriculture to take up industry in these cities, this industry must needs handle the products of agriculture and increase its importance to the nation. Not merely are the cities named above dependent on their plains, but we may be sure that other great cities will grow up in the future in similar condition at similar points, until men materially change their relations to the earth. Warsaw will soon attain million rank on Russia's plain, Budapest on that of Hungary, Hamburg-Altona has already probably reached it. In America, New Orleans will become premier city, potentially at least, as soon as we do for the Mississippi what the Germans have done for the Rhine. In those days it is hard to see how New York-Chicago will maintain the lead over St. Louis-Kansas City-New Orleans that will then be based only on the economic momentum of the past.*

Here are official data for a number of these cities:

TABLE I.

YEAR.	CITY.	POPULATION.	AREA IN SQ. MILES.	PEOPLE PER SQ. MILE.
1901	London	4,537,000	117	39,000
1900	New York	3,437,000	327	11,000
1901	Paris	2,657,000	30	88,000
1905	Berlin	1,878,000	25	83,000
1900	Chicago	1,699,000	180	9,000
1900	Vienna	1,648,000	67	25,000
1900	Philadelphia	1,648,000	128	11,000
1901	Calcutta	1,005,000	29	35,000
1901	Bombay	776,000	22	35,000
1900	St. Louis	575,000	61	10,000
1900	Boston	561,000	43	14,000

The city of greatest density of population appears to be Paris, with 88,000 people to the square mile. For Rome the area is definitely ascertainable from the well-preserved remnants of the Aurelian Wall. The space contained within this is 4.47 square miles. Had it been as densely settled as the Paris of 1901, central on the great Paris basin, fed by steamship and locomotive and housed and equipped with the appliances of modern civilization, old Rome would have contained 404,000 inhabitants. To put two million people within the Aurelian Wall necessitates the supposition of a density of 447,000 to the mile! One million, a density of 223,500! We have all heard of the teeming populations of the East. Bombay is the densest eastern city that has been counted, yet Rome, if peopled as Bombay is, would have contained 156,000 inhabitants. Bombay is head city of a province twice as large as Italy, with 26,000,000 people. It is the point where rail and steamer meet for a good part of the intercourse between Britain and her Indian Empire. Something will probably be said of Rome's suburbs and some attention will be given to modern suburbs below; but, after all, suburbs must not be taken as larger than the city itself. On all analogies we must feel that the size of the ancient city has been exaggerated. Yet the analogies we have used are entirely too favourable to Rome, for it was certainly without the modern machinery for sustaining a great population in a small space, where they must be fed and supplied from without. That the old population was less than 500,000 will be confirmed by a study of the grading of population within the cities of to-day.

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* Although Constantinople has never had a census, it is commonly regarded as of million size, or near it, the only city of that magnitude in the Mediterranean region, where all the plains are small, the population mostly thin. It has no tributary plain behind it—at least unless Russia gets it in her power—nor is it the creature of modern industry. There is not a little in its circumstances that may seem to remind us of ancient Rome. "No modern industry lives within her walls. The great mass of the population of Constantinople is unproductive and impoverished, and lives directly or indirectly on the city's character as central point of the Turkish Empire and Islam." (Philippson, "Mittelmeergebeit," Teubner, 1907, p. 242.) Yet the railways and many lines of Turkish coast steamers are completely modern, and if replaced by the ancient equivalents in land and sea vehicles, would be positively earth encumbering. Islam means something to this city that is without parallel elsewhere. The Moslem is religious as the west nowhere is, and as the Imperial Roman certainly was not. He spends his whole life, Lord Cromer tells us, consciously in the presence of his Maker. A religion that builds a Mecca railroad as Islam is doing must have enormous significance for its capital city.

There are not many people in the world in comparison with its area. Texas would hold them all and give each man, woman and child a square space seventy feet on each edge. They could *stand* much closer than that. Two thousand people can stand in a mile-long line very easily. They will have two and two-thirds feet between the centers of their bodies then. A square mile so covered would have 4,000,000 on it and the whole 1,500,000,000 of the world's people could stand so in the little State of Rhode Island. So much of that State would be still unoccupied that each could find place to lie down without needing to trespass on his neighbour's ground. In crowds on public occasions people doubtless gather more closely than that, but for their "home space," to again quote Professor Penck, it is doubtful if all the multiplication of stories in crowded city quarters ever brought 500,000 people to live in one square mile or on a smaller space at that rate.

The Eighth Assembly district in New York in 1900 contained 98 acres of ground and was peopled at the rate of 471,040 people to the square mile. This is probably the most densely settled spot on the earth. Including such streets and open spaces as it contains, this allows each man, woman and child a square seven and three-quarters feet on an edge. It is not strange that the street figures largely in the life of people here. The following table shows the greatest densities within the various cities:

TABLE II.

		ACRES.	DENSITY.
New York	* Ward 10	110	418,000
Bombay	Kumbharwada	?	383,000
London	Spitalfields	88	204,000
Paris	3rd Arrondissement	1892	198,000
Calcutta	Colootola	?	179,000
Berlin	Südliche Rosenthaler Vorstadt	408	173,000
Philadelphia	Ward 3	122	129,000
Vienna	Josefstadt	259	126,000
Boston	Ward 8	166	111,000
Chicago	Ward 16	471	86,000
Baltimore	Ward 18	192	77,000
St. Louis	Ward 16	244	56,200

* In the table and map for New York, *wards* have been used, and not Assembly districts, as no map of the latter could be obtained.

The three densest contiguous wards in New York, the 10th, 11th, and 13th, have a combined area of 413 acres and a population density of 365,000 to the mile. The whole twenty-eight square miles of Manhattan Island have a "density" of 97,000, which again is unparalleled in the world for such an area. The four densest contiguous boroughs in London: Shoreditch, Finsbury, Stepney and Bethnal Green, have a total area of five and nine-tenths square miles—much more than ancient Rome. On this live 639,380 people—117,000 to the mile. Was old Rome more densely peopled than the same area in the heart of modern London, active, feverishly active, as the Mediterranean world never knew activity, making curious wares for the people beyond the seas who send back food and the raw material of industry by fleets that carry in a day what all the shipping of classic days could not have moved in years?

But any investigation into the size of cities meets a difficulty at the outset in the question, "What is a city?" What the English call the City of London had, in 1901, 38,000 people; the County of London, 4,538,000; Metropolitan London, 7,114,000. Which is "London"? The municipalities of Spain and Latin America always include areas that are absolutely rural. Thus Murcia, Spain, which is credited in all the handbooks (in 1900) with 111,539 inhabitants, has only 32,000 of them living together in an urban group.* So other cities too: Barbacena, Brazil, is cited as having 57,850 people. The village is only of 5,000 people; the rest scattered about the country.[*] In all probability Colombia has a number of "cities" that are municipalities of this sort. On the other hand, even Greater New York does not include the whole of the essential city at the mouth of the Hudson. Jersey City and Hoboken must be included and probably also Newark. It is the deep water for steamers that makes the city there and not the shore. So the city at the mouth of the Charles includes Cambridge, Somerville and Chelsea as well as Boston.

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* *Petermanns Mitt. Literaturbericht*, 1906, p. 188.

For a comparative study of cities it is plain that the geographer needs some urban unit more definite and unvarying than the district of one city government. And such a conception is familiar enough to all. Close occupation of the land with buildings constitutes the city character, and this closeness may be made our criterion. If there are but a few hundred people to the square mile, our conception of a city is not satisfied. The high price of land that characterizes cities comes of occupation so close as to make competition for ownership. The improved paving, lighting and policing all depend on the gathering of numerous tax-payers into a small space. The better theatres, concerts, libraries and schools are possible only because a great number of potential patrons are gathered together.

It has long been recognized that a fair idea of a people's occupation and mode of life can be gathered from the density of their distribution through their territory. Thus Wiechel,[†] gives the correspondences between density of population and occupation, which he illustrates by geographical examples:—

TABLE III.[‡]

DENSITY.	OCCUPATION.
0 — 8	Hunting and Fishing.
8 — 26	Grazing and Forestry.
26 — 64	Beginnings of Agriculture.
64 — 192	Agriculture.
192 — 256	Beginnings of Industry.
256 — 381	Agriculture and Industry.
381 — 512	Industry predominates.
512 — 2,560	Industrial towns or suburbs.
2,560 — 5,120	Centers of small cities.
5,120 — 12,800	Centers of moderate cities.
12,800 — 25,600	Centers of large cities.

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[*] Supan, "Bevölkerung der Erde," XII, 1904, p. 63. See, also, Gannett for Cuba, *Nat. Geog. Mag.*, Feb. 1909, p. 200. The same thing occurs also in Italy.

[†] "Eine Volksdichteschichtenkarte von Sachsen," Teubner, Leipzig, 1904, p. 169.

[‡] The densities given in the table are supposed to be *uniform*. One cannot regard the United States as at the beginning of agriculture, for instance, because its *average* density is 28.

As the table, which is here given, in much simplified form, has been constructed from observed facts, its general indications are fairly sound. Of course, the precise placing of limiting values between neighbour occupations is arbitrary. Is it exactly at 192 people to the square mile that agriculture passes into industry? Can there not be manufacturing with a density of 191, or exclusive agriculture with 193? The scheme must not be applied so closely. And so with cities. It is plain that there is some density of population that is urban, though the assignment of any definite numerical limiting value is necessarily arbitrary. Nevertheless, it is thought useful to assume it at 10,000 people to the square mile—not far from the official average density of our American great cities. *A continuous area having everywhere 10,000 or more people to the square mile is a city.** If all the buildings of a city were dwellings and they were evenly distributed throughout the city, 10,000 to the mile would not occupy the ground very closely. It would correspond to blocks of four and three-quarter acres surrounded by a sixty-foot street, half the street width being counted to each block. The block would be subdivided into twenty house lots in two rows of ten, each lot measuring 50 by 150 feet, and each containing a house with four inhabitants. There might easily be twenty-five feet between houses and roomy front and back yards. In actuality, however, there is much inequality in the distribution of the inhabitants of a modern city. Necessarily, there are many other buildings than dwellings; factories, shops and warehouses, schools, places of amusement and government buildings, all of which will lessen the house space by large amounts. Railways, too, by their trackage take an enormous amount of space in the larger cities. Under the high prices that result from demands for land for these uses the house lots of the people diminish greatly in size, the yards nearly disappear and the number of inmates of each house becomes much larger. Reference has been made to Professor Penck's significant division of the useful areas of the world into "sustenance spaces" of the people and their "home spaces." The latter include a proportion of the not-dwelt-in areas of their neighbourhood. In large cities the home spaces are often too small to allow the inhabitants a wholesome supply of good air and the only check that public sentiment can oppose to this tendency is the introduction of parks and public gardens. A result is an increased mortality in some proportion as the city is larger and its population-density greater. Thus, in the European cities cited in Table I, densities and death rates are all high. It is not probable that the mortality statistics for European and American cities are comparable, the difficulty lying in the differences of date and different methods of compilation. Still, the accordance of mortalities and densities are too close to be casual. Densities are given here in people per square mile and mortality as deaths per thousand inhabitants. The close grading of mortality with density is striking:

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* For distinction from the political city, this may be called the *anthropographic* one, or city according to the distribution of people, just as lines indicating grades of population-density may be called isanthropic lines and the maps isanthropic maps.

TABLE IV.

CITY.	DENSITY.	MORTALITY.
Paris	88,000	23.8
Berlin	83,000	23.1
London	39,000	17.2
Vienna	25,000	21.5
New York	11,000	20.2
Philadelphia	11,000	18.8
Chicago	9,000	15.3

Cities are plainly unfavourable to long life and the greater the city the greater the danger. London has not long been an exception, and its present good condition is due to recent, definite effort. Chicago is the least "citified" of the world's great cities from the anthropographic point of view, and the safest to live in.*

The gradations of mortality within Chicago in 1900 are equally striking. Here are the figures grouped in four grades according to the density of population:

TABLE V.

GROUP.	WARDS WITH DENSITY OF	MORTALITY PER 1,000.
I	50,000 up	16.7
II	25,000 to 50,000	15.3
III	10,000 to 25,000	13.6
IV	under 10,000	11.8

The last group consists of the suburban wards.

Interesting, too, are the figures from New York. They appear to be prepared with unusual care. Individuals that enter hospitals and other "institutions" have their ward of residence noted in order that deaths which occur may be referred to the proper ward of origin.*

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* The biennial *Report* of the Department of Health of Chicago for 1904-5, p. 190, claims that "here and there a population between 300 and 400 per acre, 192,000 to 256,000 per square mile, can be found." Such areas must be very small, but see below. Chicago's wards are so large that they allow considerable variations of density within them. Smaller subdivisions would undoubtedly give higher maximal densities. Thus in London the densest borough is Southwark, 1,132 acres of land, settled at the rate of 116,000 people to the square mile, but upon examining the registration districts, which are smaller, we find the much greater density shown in Table II.

The following are the densities and mortalities of New York's five boroughs as reported by the Board of Health for the first quarter of 1908:

TABLE VI.

BOROUGH.	DENSITY.	MORTALITY PER 1,000.
Manhattan	97,000	19
Brooklyn	19,000	18
Bronx	4,000	17.4
Queens	1,200	16.7
Richmond	1,100	19†

Interesting light on the healthfulness of large cities is shown by studies in the meteorology of Berlin in the June *Meteorologische Zeitschrift* for 1909. Berlin finds that its growth into a great city causes even its house-tops to have less wind than the country around, and much less than used to blow in the smaller Berlin of twenty-five years ago. This is established by twenty years of recorded wind velocity on the tower of the Joachimsthaler Gymnasium, in the southwest part of the city. The instrument is about 134 feet above the ground and in 1884, when it was set up, there were no other buildings in the neighbourhood. Now there are houses all around and their roofs come within thirty feet of the level of the anemometer. The effect is just the same as if it had gradually sunk down from a height of 134 feet above the ground to within thirty feet of it. It is familiar knowledge that the winds everywhere blow faster above than near the obstructing surface of the earth, and so the record here shows slower and slower winds as the roof-level has crept up toward the instrument. In the successive pentads from 1884 to 1903 the wind had an average velocity of 12 miles per hour, 11 miles, 9 miles and 8 miles, a steady diminution to two-thirds of its former amount. This is as true for each single month as for the average of the whole year. In the main it must be a loss to the healthfulness of the city because of diminished ventilation and the diminution must be much greater down in the city streets.

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* This is not done in Chicago and constitutes a defect in their mortality returns, for while the 1,510 deaths reported in Chicago institutions are added in when the city mortality is being computed, they are missing from their several wards of origin, nor is it likely that they have originated in equal proportions from all wards.

† Richmond has an abnormal number of residents above 60 years of age.

Storm winds, however, appear to be checked in much greater degree than lighter ones. Every month averages smaller values now for its strongest daily wind than in the earlier period and the decrease is greatest in the windiest months. From 1884 to 1893 the average velocity of the strongest daily wind of September was five and a half miles greater than from 1894 to 1903; of December ten miles greater. The strongest winds have diminished still more. In the first decade July had a maximum record of 35 miles per hour, which fell in the second decade to less than 30. But December, which had a maximum record between 1884 and 1893 of 47 miles per hour, only attained 30 in the ten years following. Down in the streets, storms are felt still less.

The checking of the wind is accompanied by a rise of temperature, the city being a degree and a half F. warmer in winter and two and a half in summer than the country about. Summer evenings in the dewless city often remain 7° F. warmer than the open country.* This higher temperature does not appear in earlier records made when Berlin was small.

The low population densities that characterize American cities are, in part, due to youth, in part to the inclusion of large suburban areas. The isanthropic map of St. Louis (Fig. 1) shows this well. The five outer wards are very large, covering in all some forty square miles of ground. The world-wide principle of small population where the political subdivisions are large would lead us to suspect them to be thinly settled. And so they are. The numbers on the wards are the densities per square mile with the last three figures omitted; thus 3 stands for 3,000 per square mile, 56 for 56,000 per square mile. As the outer wards do not reach the anthropographic limiting density of 10,000 to the mile, they have been left unshaded and should be classed as suburban, and their area and population subtracted from the figures of Table 1. This leaves a population of 452,000 on an area of twenty square miles, the shaded part of the map. The lightest shade on the map represents densities of population from 10,000 to 25,000 to the square mile, the next 25,000 to 50,000, and the darkest shade on this map over 50,000. It is, of course, quite unjustifiable, as any citizen of St. Louis will perceive, to subject the size of that city to an arbitrary reduction. No such reduction can be effected by any means. What is here proposed is to compare those portions of various cities that have more than a certain density of population. A city is "a close agglomeration of houses." The attempt is made in this paper to put a certain definiteness on this closeness. But there is still an evident defect in the procedure. The northwestern large ward with a density of 3[000] to the mile, marches on the southeast with a ward with a density of 21[000]. Undoubtedly, the people are more closely settled in the

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* *Meteorologische Zeitschrift*, 1908, p. 333.

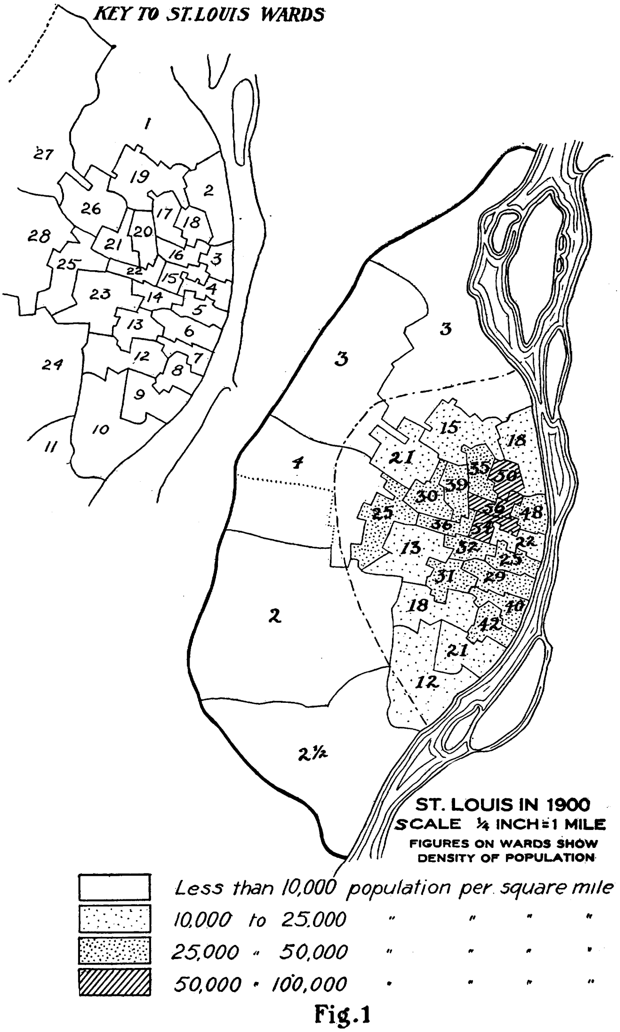

Fig.1

southeastern part of Ward 27. This is shown, too, by the increasing density numbers in the successive wards to the southeast, culminating with 56,000 in Ward 16. The exact grade of 10,000 density should, therefore, fall somewhere between the centres of the two Wards, 27 and 26. If we locate it as we should an isotherm,

$\frac{10-3}{21-3}$ or $\frac{7}{18}$, the distance from the center of the outer ward toward that of the inner one, we find the sought-for isanthropic line passes through the larger ward. A portion of that ward, therefore, has "city" density, and the population and area of this portion should be added to the shaded area already counted. The same thing is true of all but the southernmost of the five outer wards. Such an isanthropic line has been drawn with dot and dash on the map, and from its study it appears that nearly 50,000 people on four square miles should be included in the anthropographic city. Anthropographically, St. Louis had, in 1900, 500,000 people living on 24 square miles of land with a mean population density of nearly 21,000 to the mile.

The lighter shade on the river bank—Ward 4—is the business center, excentrically placed, as in so many American cities, where the life-giving river is used as a boundary and not as the artery it would be in the Old World. The thinness of population within a denser ring here is characteristic of all great cities. Here public buildings, shops and hotels have crowded dwellings away to cheaper land. As the city grows larger this process will go still further, the central district actually losing inhabitants. The darkest shade of the map indicates the city slums, between Pine and Herbert Streets and 11th and 22nd, in Wards 15, 16 and 18, where the dwelling is the tenement house. Beyond are residential wards of better houses with larger yards, coincident with the lightening shades of the map.

Chicago is much similar to St. Louis in its anthropography, although so much larger. The scale of the drawing (Fig. 2) is the same and the grades of density the same. Again we see the thin core of the business center, Ward 1, with sky scrapers, public buildings, the great hotels and the costliest land in the city. It will be recalled that the greatest mortality in the city was in the wards of over 50,000 people to the square mile. It is now seen that these lie along the two branches of the Chicago River. The whole strip along the west side of these waterways has since been united for sanitary reports into the fifth sanitary division. "The population of the division as a whole is mainly of the poorest classes, with a large foreign element and a relatively large child population. The sanitary conditions are extremely unfavourable. The dwellings are old, largely of wooden construction and usually overcrowded. Factories, lumber yards, storage warehouses, grain elevators, railway freight yards, etc., occupy the river front. The increasing number of factories is

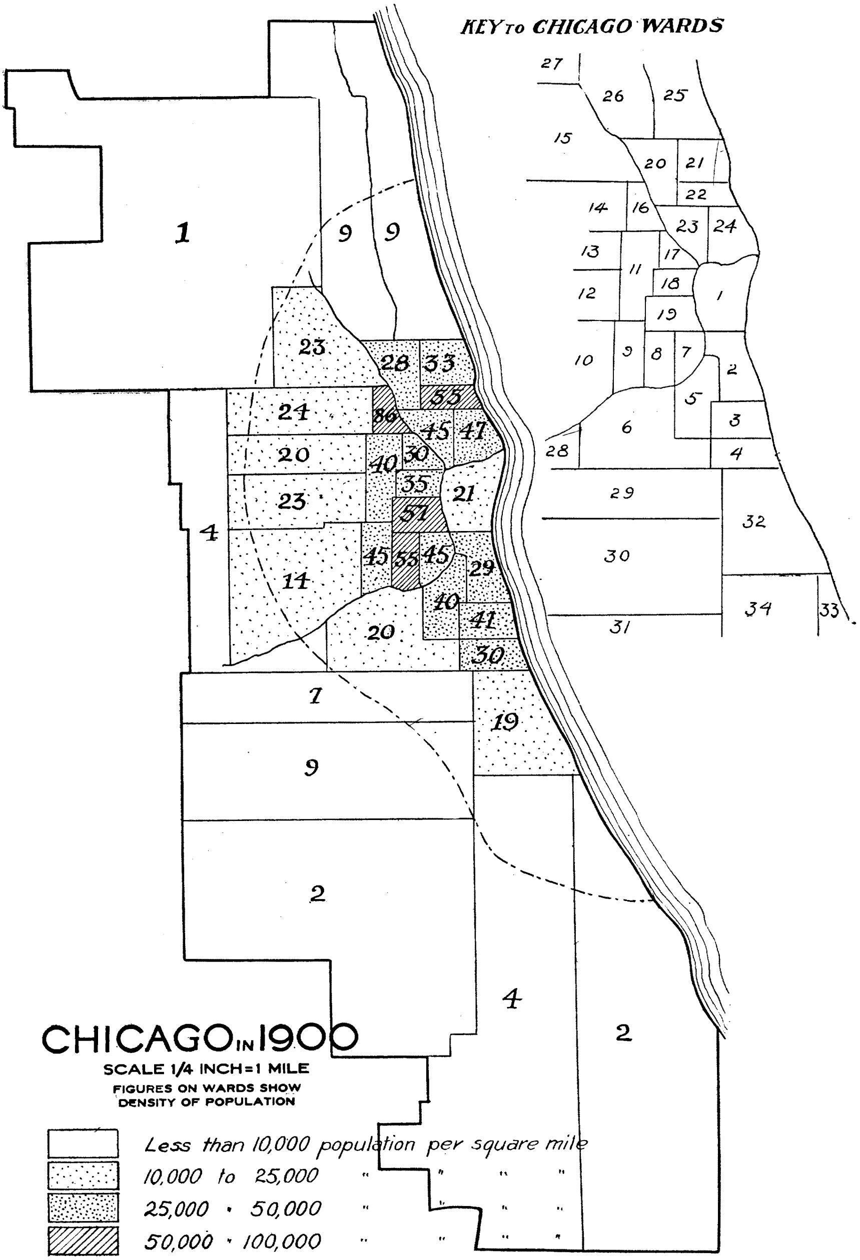
KEY TO CHICAGO WARDS
CHICAGO IN 1900
SCALE 1/4 INCH=1 MILE
FIGURES ON WARDS SHOW DENSITY OF POPULATION
Less than 10,000 population per square mile
10,000 to 25,000 " " " "
25,000 " 50,000 " " " "
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Fig. 2

gradually driving the population westward."* Mr. Ralph Blount writes:

"The poor people live in the river wards because it is within walking distance of much work. Land there is expensive and flats are not cheap, but the people crowd together and so meet the expense. The heavy belt would reach all'round the core, to the lake, if the best places along the lake were not taken by the wealthy. Ward 24 (now 21) just north of the mouth of the Chicago River, is especially a residence for nabobs. In the river wards the houses are miserable. Many of them are old wooden structures, moved in from places where new buildings have been put up. The back yard is commonly occupied by a rear tenement, leaving no open ground. No wooden buildings are permitted to be built except in the outlying parts of the city, but thousands of old structures are allowed to stand and even to be moved from one lot to another. On oppressive evenings of the warm weather one may pass along Halstead Street and seem to find the whole population out of doors. Women and children, very scantily dressed, may be seen at all hours of the night, sitting asleep on the steps. In this region is much sidewalk vending."

The thinning of the ring of heaviest population west of the junction of the branches of the Chicago River is accounted for by the Union depôt and many tracks from the south and west. The entire northern part of the area is taken up by railroad tracks. It contains a very large number of small factories, stables, offices, stores and amusement places and Union Park.

The large outer wards are thinly settled, if less so than at St. Louis. There are 123 square miles of these suburban wards, averaging under a density of 10,000. The shaded portion of Chicago contains 1,287,000 people on 57 square miles. Sketching in the isanthropic line as at St. Louis, another 15 square miles with 200,000 people living under "city" conditions are found to be added to the inner part. An anthropographic city of 1,500,000 people on 72 square miles of ground results. The mean population density is near 21,000.

The people of Philadelphia are grouped in their city in very similar fashion (Fig. 3). The thinly settled core of the business center is the Ninth Ward, elongated east and west, as it contains the district between Chestnut and Market Streets, both running east. Here are the city hall, post office, two great railway stations and the finest stores and office buildings in the city. The population is but 17,000 to the square mile. About this is the usual denser ring, considerably denser than at Chicago and over a greater area. So a new shade appears on the map for a density above 100,000 to the mile. This is found in the Third Ward along Catherine, German and Christian Streets. The two- and three-story houses, especially

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* Biennial *Report* of the Department of Health, City of Chicago, 1904–5, p. 253.

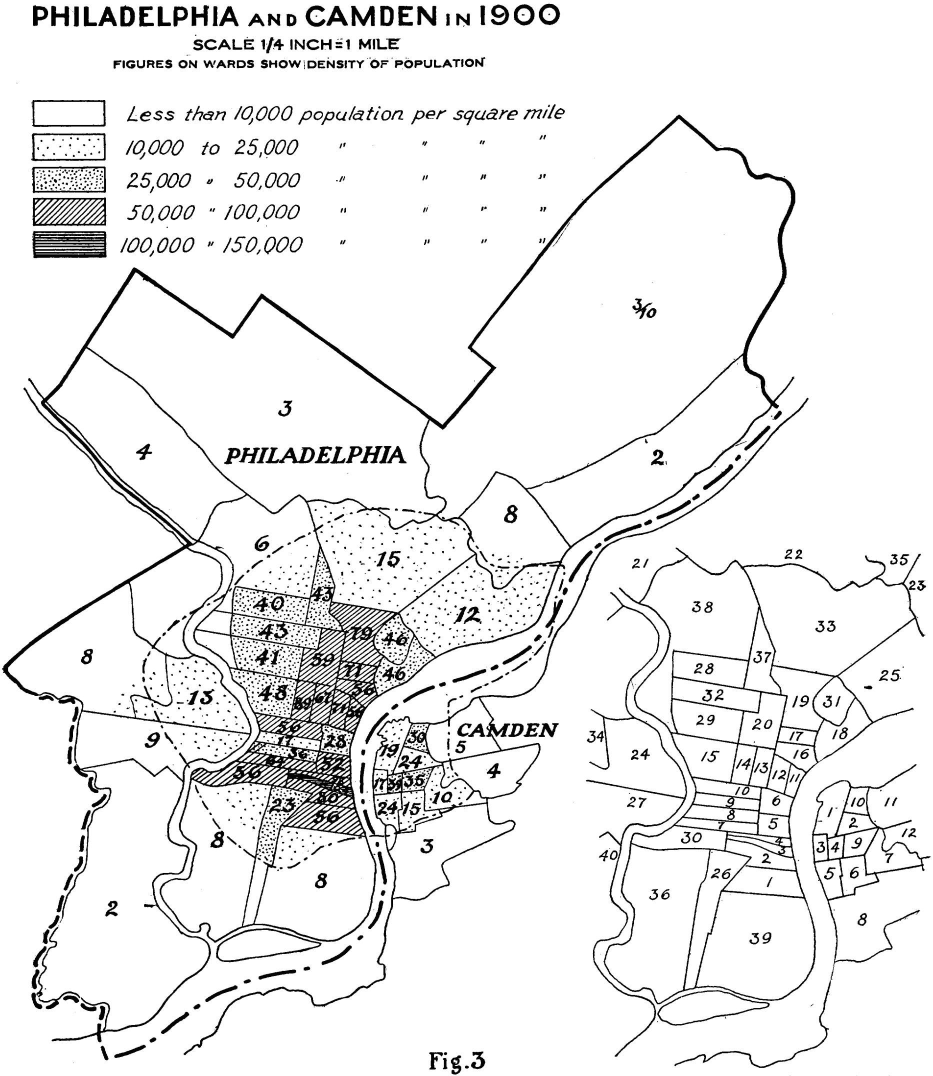
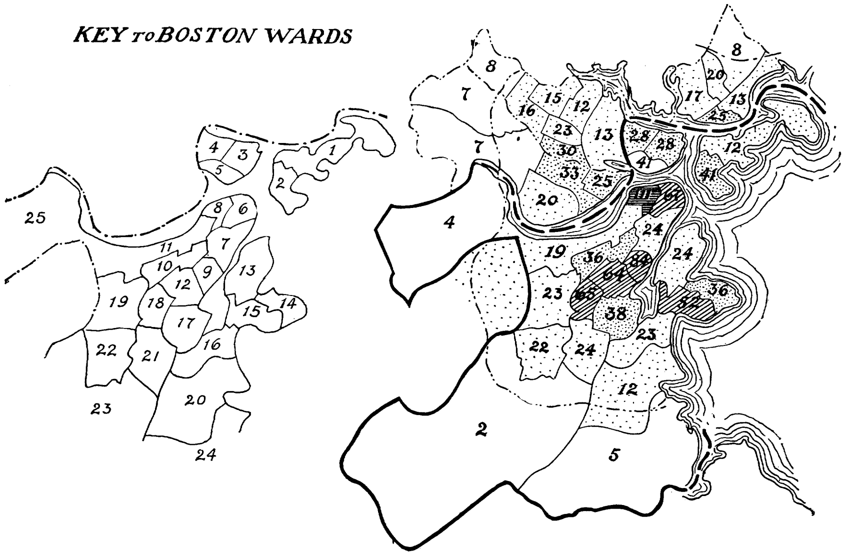


Fig. 3

KEY TO PHILADELPHIA AND CAMDEN WARDS

at the east end of the ward, are closely inhabited by a foreign population which fills the streets even in winter, so that passing is difficult. On the shops foreign signs predominate, many of them Italian, many of them Hebrew. The sidewalks are much encumbered by stalls, tended often by the women while the men gather and transact business in the street. Beyond the denser ring comes the usual thinner district of better homes, and beyond this the suburbs of enormous extent within the political limits of the city, just as in Chicago and St. Louis.



BOSTON IN 1900
Including CAMBRIDGE
SOMERVILLE, CHELSEA
AND BROOKLINE
SCALE 1/4 INCH=1 MILE
FIGURES ON WARDS SHOW
DENSITY OF POPULATION

☐ Less than 10,000 population per square mile
░ 10,000 to 25,000 " " " "
▒ 25,000 " 50,000 " " " "
▨ 50,000 " 100,000 " " " "
▤ 100,000 " 150,000 " " " "

Fig.4

The influence of ocean-borne commerce in the Delaware is sufficient to lead to considerable settling of the New Jersey shore.

Though the river is the political east boundary of both Philadelphia and its State, Camden shares in its commercial and industrial life and has a considerable area belonging to the anthropographic city. The line of 10,000 density has been drawn on the map as usual. Within it Philadelphia has about 34½ square miles and 1,073,000 people. Camden, politically mistress of 7 square miles and 76,000 people, has an anthropographic 3.3 miles and 69,000 people. The two together make up an anthropographic Philadelphia of 38 square miles and 1,142,000 people—30,000 to the square mile.

Boston (Fig. 4), like Philadelphia, needs the 100,000 shade for one ward, the 8th, in the North End. But the density in portions of this ward must be very much greater, for it includes the state house and grounds, the Charles Street jail, the Massachusetts General Hospital, as well as the North Union station and no little trackage on the east, and the Charlesbank open air gymnasium on the west. The ward includes all the space between the river and Cambridge, Chardon, Traverse and Charlestown Streets, as well as a strip from the Common northward between Joy and Bowdoin. The business center falls in Ward 7 (see key to numbers of the central wards) where the density is 24,000 to the mile. It is less well surrounded by a denser ring on account of the irregular mingling of land and water in Boston, and also on account of the presence of the Common in the west end of the ward, which brings the residential quarter on Commonwealth Avenue in Ward 11 close to the business center. As the Charles is not a State boundary, Boston has grown across the river by incorporating old Charlestown and East Boston, just as European capitals sit astride their streams, Anthropographically, the incorporation must go still further and take in also Cambridge, Somerville, Chelsea and Brookline. The isanthropic line has been drawn and the official and anthropographic figures for the area in whole and part follow:

TABLE VII.

GREATER BOSTON IN 1900.

	OFFICIAL.		ANTHROPOGRAPHIC.	
	AREA. SQ. MILES.	POPULATION.	AREA.	POPULATION.
Boston proper	38.5	561,000	18	501,000
Cambridge	6.5	92,000	4	78,000
Somerville	4.2	62,000	3	56,000
Brookline	2	20,000	1	15,000
Chelsea	2	33,000	1	31,000
Greater Boston	53.2	768,000	27	681,000

The density of population becomes 21,500 to the square mile and the city fourth in size in the United States.

The reader who has gone so far in this paper may, perhaps, be disturbed by its style of arithmetic. The figures dealt in here are very "round," as if fifty or a hundred thousand inhabitants more or less did not much matter. That, of course, should not be said; but it is a plain matter of fact that we do not know our million-cities within anything like a hundred thousand of the actual number. Let us not delude ourselves in this matter; quite apart from the problem presented above "What is a city?", involving the attempt at standardizing the concept which is here being made, the figures that censuses give us must be scrutinized after all the conscience and intelligence that the census taker has put into them. There is such a thing as a fictitious accuracy that would carry significant figures to units or even fractions without being critical of the correctness of the figures in the hundred thousands place. This is so prevalent in geographical works to-day and so serious, that an example is here introduced. An American publishing house gives the area of North America as 8,035,632 square miles, seeming to know it to the mile, yet that quantity has a palpable mistake of 2,440 miles, introduced, not by the printer, but by the compiler of the figures! There is interest in examining the case. The figures are stated to be "from Supan's Bevölkerung der Erde." Supan, of course, gives square kilometers, and for each omits the units and tens, leaves them ciphers, meaning, of course, that we have not knowledge of the areas in question to anything like that degree of accuracy. By comparing the American figures in question with Supan's, it is seen that the reduction has been made in each case by multiplying by the factor 0.386. As this is precise in each case, it is no misprint that is involved. Thus from Supan's 20,817,700 square kilometers have been derived the figures above. But one square kilometer equals 0.3861161 square miles, and in dealing with millions those last four figures are important, for the use of the full factor makes the area 8,038,072 square miles, which is greater than the figure given by the publishers by 2,440 square miles. And so all the other continents. The figures they give have a fictitious appearance of accuracy. The present writer does not believe the area of even Europe is known within ten thousand square miles.

All figures are liable to errors, and no user of them is safe who does not have some idea of the magnitude of these errors. The director of the census estimates that any census should be accurate within one per cent.* This would mean that Boston's population, reported as 560,892, is probably within 5,609 of that number, or between 555,283 and 566,501. About 561,000 is not an inaccurate statement of it, therefore, there being some doubt about the tens of thousands. Furthermore, city populations are actively growing, even in countries with stationary total population, like France. It is without meaning to state the population of a big city without giving a date. Thus, if we adopt the close formula for the growth of Greater Boston by Mr. Frederic H. Fay,† and modify it to the case of the slightly larger anthropographic city, the number of thousands to be added in each year after 1900 will be successively 15, 30, 45, 61, 76, 91, 108, 123, 139 and 155. In this year 1909, therefore, it is 820,000; in the new census year where it may soon be tested, 836,000. With the hundreds and probably thousands figures in doubt and some fifteen thousand a year of increase, is it worth while to cite significant figures in the last two places? Where such work as Mr. Fay's has been done, it would be best to state the city size as 681,000 in 1900 with 15,000 growth a year. As for the method of drawing the isanthropic line of 10,000, it is a makeshift, perhaps the best thing that can be done to remedy the existing lack of uniformity in the meaning given to the name "city." The census taker or the local official who assembles the data could do this thing far better at the time of the census than anyone can ever do it afterward. It is believed, on much study of the whole matter, that our present result for Boston should not be 50,000 in error, perhaps more for larger cities. Even thus the city figures become far more accordant, more fit for comparisons, than anything now extant.

New York (Fig. 5), of course, has anthropographic interest for us in greater degree than other cities. The absoluteness with which the island of Manhattan is limited geographically has caused a phenomenal condensation here. If the tunnels recently opened west and east are to destroy this limitation, material redistribution of people can hardly come in time to show before the census of 1920. Two new shadings for density have now to be introduced, one for 150,000 to the square mile, which we shall see used again in Europe, and the deepest of all, which appears in Manhattan only, that for 300,000. Here, again, the State as well as the political city is bounded by the Hudson. Where only the East River bounded the city, it has grown across into Brooklyn as also into Staten Island (Richmond borough) across the Hudson, where the State boundary also swerves away from that

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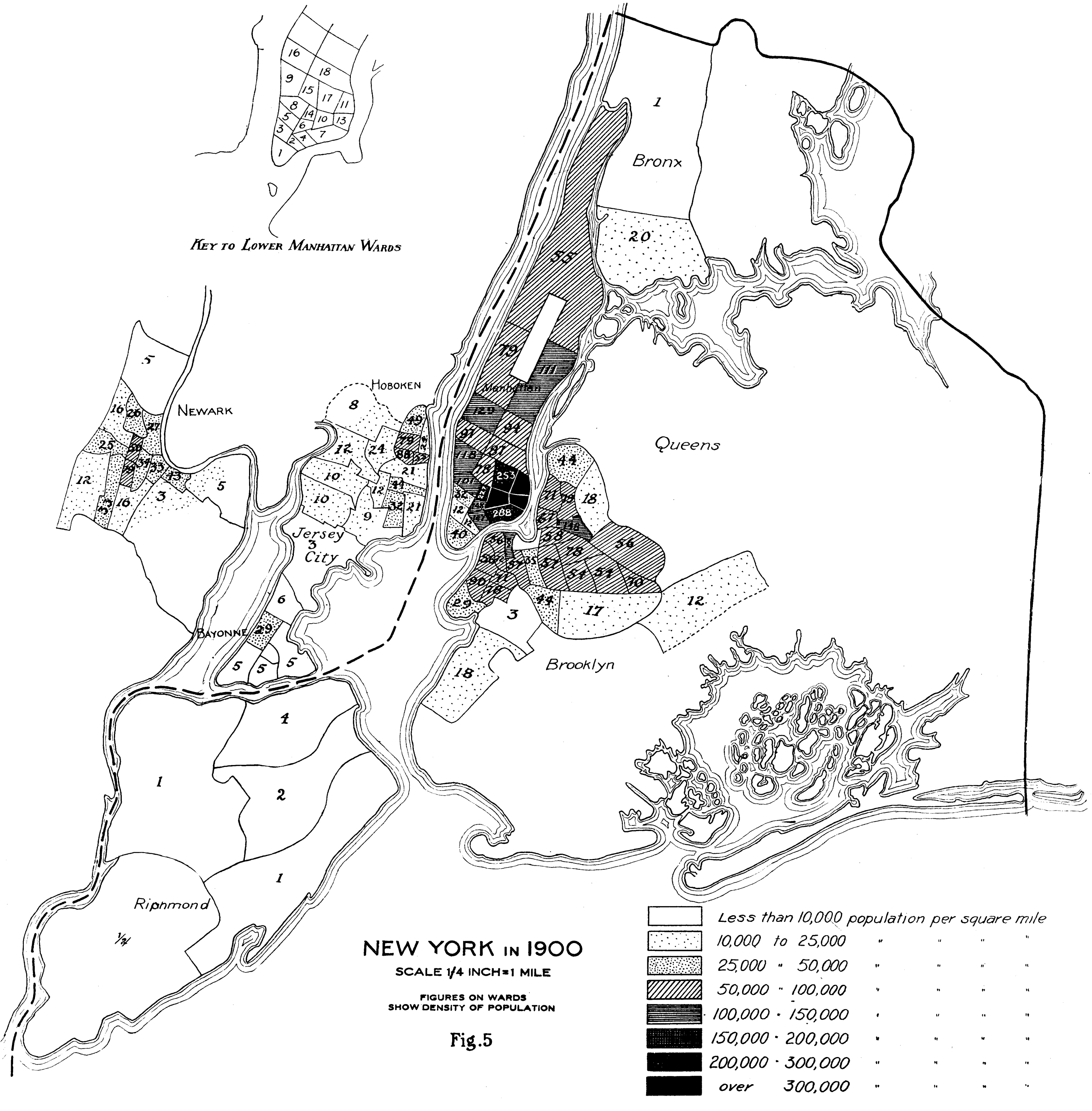
* "Census Bulletin," 149, Washington, 1902, p. 15.

† "Population and Finances of Boston," Boston, 1901, p. 9.



NEW YORK IN 1900

SCALE 1/4 INCH = 1 MILE

FIGURES ON WARDS SHOW DENSITY OF POPULATION

Fig.5

river to the westward. It is certain that only the State boundary prevents the inclusion of Hoboken and Jersey City. Anthropographically and, indeed, commercially they are a part of the city to-day. On four successive voyages out of New York the writer has sailed from Brooklyn, Jersey City, New York proper and Hoboken. Bayonne is not a part of it, for the diagram shows plain suburbs between it and Jersey City, so that it is not continuous with the urban population. Newark might seem to be in some doubt. It is here included, on the ground that there is only water and tidal flats between it and the rest of the city, and water must be recognized to connect rather than separate. Readers will hardly need reminding that most of the Jersey shore opposite Manhattan island is occupied by the steep bluffs of the Palisades. Figure 5 displays all this as well as the enormous open spaces of Queens, Brooklyn and Richmond boroughs. It is not at all probable that the parts of Queens that march with Brooklyn are purely suburban as here represented, but the data of nine years ago are regarded as so ancient in all great American cities that the ascertaining of the ward boundaries of 1900 has been the work of much labour, and especially so in New York. In Queens they could not be ascertained. The five wards have densities of 7,000, 1,800, 800, 500 and 1,200 respectively. Twenty thousand, about half the population of the densest one, have been added as suburban. The results of the discussion of details give us for New York in 1900:

TABLE VIII.

	OFFICIAL.		ANTHROPOGRAPHIC.	
	AREA. SQ. MILES.	POPULATION.	AREA.	POPULATION.
New York	307.7	3,437,202	50	3,150,000
Jersey City	18.25	219,462	11	198,000
Hoboken	1.22	59,364	1.22	59,000
Newark	15.50	246,070	10	229,000
	342.67	3,962,098	72.22	3,636,000

From census estimates in 1906 it appears likely that this anthropographic city is growing 120,000 a year. By 1909 it would have come to be a city of nearly 4,750,000. Wards 10, 13, and 11 in the lower city, have respectively 418,200, 383,500 and 323,700 people to the square mile, the greatest density known in the world. "The people are largely Russian Jews, living at times 300 to a building in old, three- to seven-story houses, though there are some new six-story flats with very small rooms where five families live on a floor. It is a sight worth seeing to watch the people in the street on a good day, absolutely filling it. One must walk in the middle of the street to avoid the children. A large part of these people are tailors and desperately enterprising. Ward 13 was lately Irish and American, but the Jews are driving them out.*

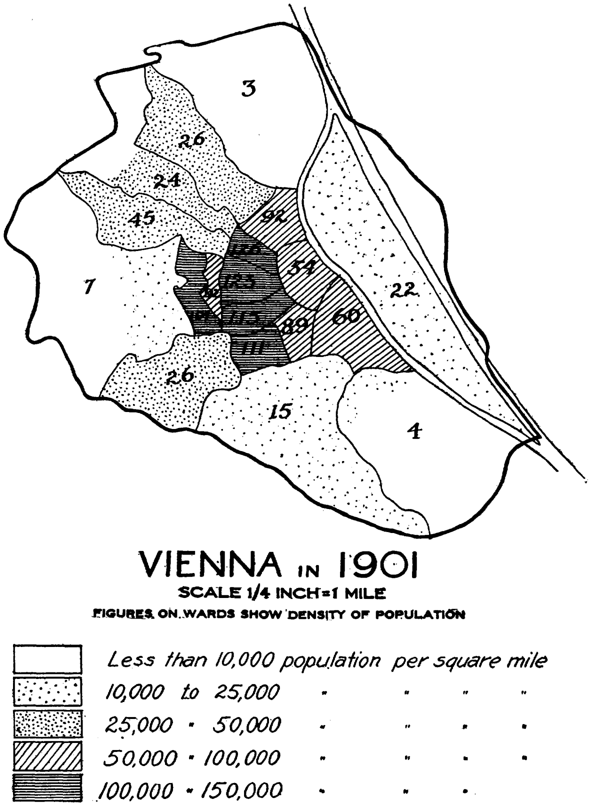


Fig. 6

The business center, toward the southern tip of the island, is easily made out by its greatly lessened density of population, falling almost below "city" grade in Wards two and three, at 12,000 to the mile. Here are the famous skyscrapers, office and newspaper buildings, which extend northeastward along Broadway. There are few dwellings in this part of the city, most of the old buildings being used for wholesale or commission business, warehouses or factories.

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* Communicated by Dr. Ellsworth Huntington, as reported by a New York police sergeant.

The shape of the island affords little opportunity for a surrounding ring of denser population. The Americans have in great part moved to Brooklyn, with the multiplication of Jews and Italians.

Vienna is the only one of West Europe's great cities with open spaces within its political limits, such as we have found characteristic in America. This has been true only since 1890, when the outer suburbs were annexed, with a good deal of unoccupied land between them as they radiated away along the western highways of approach. As the ground on this side is very rugged, Vienna now has a mountain within its walls where the citizens may shoot without having to pay the old-time game tax at the gate.* Figure 6 shows the city densities, data being taken from "Statistisches Jahrbuch der Stadt Wien, 1903," p. 53. As with Chicago and St. Louis, the center, Innere Stadt, with 54,000 to the square mile, is excentrically situated on the bank of the Donau canal, with a denser ring about. Mariahilf and Neubau, recognizable on our map by the density numbers 115[000] and 123[000], have most of the city's factories. Beyond this district population falls off to the outer limits.

The one-sided position of Vienna on the right, high bank of the canal is well described by Gulliver.† It is the more striking since other European cities tend to a circular arrangement and occupy both banks of their streams. It especially resembles St. Louis in this general arrangement, for east St. Louis is as much hindered in its growth by the lowness of the east shore and its liability to flood as by the geographic unwisdom of using a river for a boundary.

The population adjoining the outer suburban districts is so dense that we must suppose their nearer portions at least are also within the isanthropic line of 10,000, so rather more than a third of the population of these suburban districts has been added to the population within. Vienna's anthropographic population is about 1,600,000 for 1900 on an area of 48 square miles.

In Berlin (Fig. 7) we come to a type of city that has no open spaces within except those that have been set aside as parks to remain open and keep the city beautiful and wholesome. These cities have expanded against the restraining influence of city walls and at times against distinct statutory attempts to limit the city growth.‡ Again and again they have broken through these restraints, and to-day we find them grown quite beyond their legal and corporate limits. The contrast here to the American cities that seem to set out a limit to which they hope soon to grow is not a result of the great rapidity with which our towns grow, for Berlin's growth is quite as prodigious, but is rather a result of the long history and old fixed institutions of Europe.

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* Oral communication of Professor Penck.

† "Vienna as a Type City," *Journal of School Geography*, 1900, p. 176.

‡ In the case of London.

Fig. 7 shows this contrast well. The open space at the west end of the city is the Thiergarten. It might properly be divided among the adjacent city districts to find correct areas for computing density of population, since it does make the population less dense in effect.

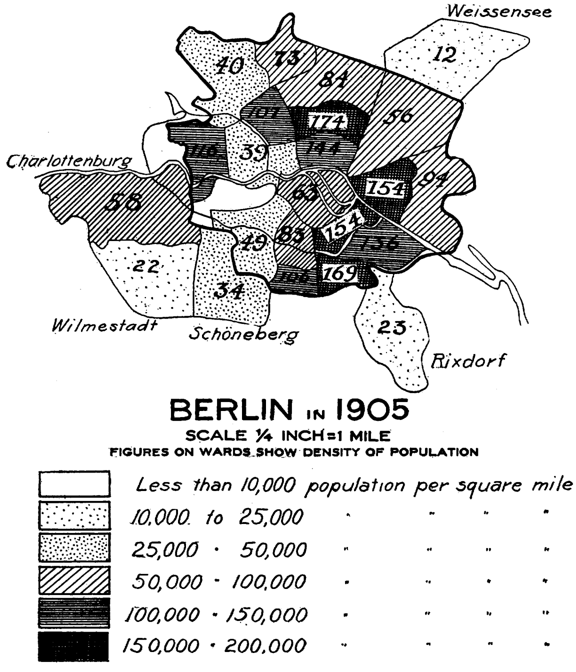

Fig.7

As it does not happen that this would change any of the shades adopted on our map to show grades of density, it has not been done.

There is the usual thin core of the monumental and business part of the city, here centrally placed within successive denser rings. Between 1895 and 1905 the inner parts of the city, the districts numbered for density on Fig. 7, 154, 174, 144, 63, 154, 169, 49 and 39, have all lost population, both in density and total numbers. This has been attributed to the recent development of electric railways, but is better referred to the pressure of the growing city mass towards its central part. The bigger the city the higher the rent in the central parts, expressed here in sums far above any possible return from use for dwellings, but appropriate to enlarged business opportunities. This elevated rent is entirely adequate to drive dwellings out of the central region. People do not go away because a convenient means of transportation is provided, unless some force or attraction starts them. Transportation facilities rather work indirectly by giving attractiveness to regions formerly not usable. They must rather increase the total area of the anthropographic city toward its outer thinner margin than diminish the inner density.

The dense ring about Berlin's center would doubtless be uninterrupted if we had the data for some smaller unit of subdivision than the Standesamtbezirk. The outlines of these are not here drawn with precision, but are constructed from the street map of the city and the district lines as given in the Brockhaus *Lexikon,* a little vague in places.

The bursting out of the population beyond the city limits is manifest in the partial ring of cities without that belong to Berlin's population-mass, Charlottenburg, Deutsch Wilmerstadt, Schöneberg, Rixdorf and Weissensee. They are far above the urban type in density and continuous with the city. Charlottenburg has a density of population greater than any part of St. Louis, and a third of a million people. It should be included in the anthropographic city and not as suburbs, for life there is urban entirely. The addition of these districts is as necessary to get a sound concept of the city there as exclusion of thinly settled regions within Chicago or Vienna. This urban character is of doubtful advantage to Charlottenburg. On a good many grounds the superiority of the country over the city to live in is manifest. Our brief consideration of mortality rates will serve as an example of this superiority. In the present study, considerations of a civic pride that makes one glad to hear how big his own city is have no place. We are looking for a well-founded distinction between urban and suburban groups of habitations.

Our result in this case is an anthropographic Berlin, in 1905, of 2,584,000 people on 44 square miles. It is very likely that there are small extensions of continuous population other than those here noted, but it is not believed that they would cause a considerable increase in the numbers.

Paris (Fig. 8) is even more compactly crowded within its civil limits than Berlin. The Arrondissements are consecutively numbered in a spiral, beginning near the center with the one whose density is given in Fig. 8 as 86[000] to the square mile, and going around continuously to the right to terminate with the 20th, numbered

81[000]. The "Louvre," 1st arrondissement, is thinned by public gardens and edifices, while the 3rd, just east of it, has few monuments and is closely packed with dwellings. It is a part of the usual denser outer ring. The uniform prevalence of a high degree of density in Paris is striking. It will be remembered that this has been a million-city since 1850. There is a relation between the two facts, especially as fortifications and city walls were formerly more significant than to-day. The empty space on the west is the Bois de Boulogne. Almost on every hand the population has burst out beyond the limits in a ring of population politically suburban, but anthropographically of city character. There are appearances of city districts on the north, but the amount would not perhaps be large. The result obtained for 1896 was 2,874,000 people on 44 square miles, those for the outer districts for 1901 not being at hand.

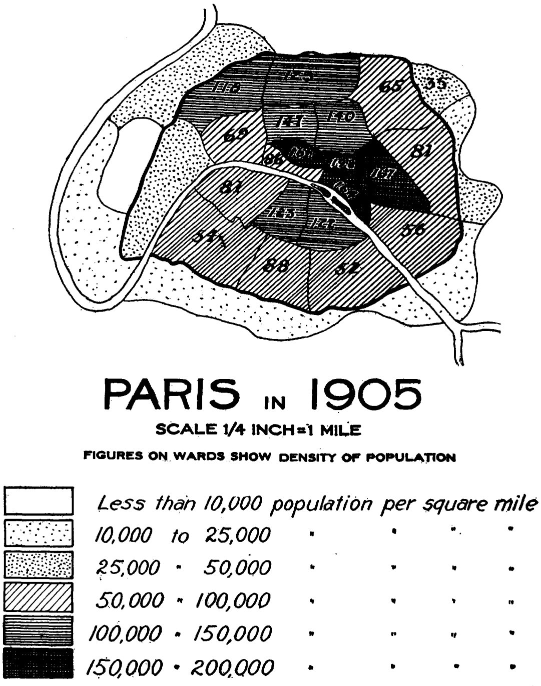

Fig. 8

For London, the only century-old city of a million inhabitants, fortified by the seas around its island, a full study is made possible by the admirable British census volumes, in which are given the areas and maps of all enumerated districts. The registration districts have been used as units and they are small enough fairly to represent the gradations of the actual peopling. The city is very symmetrically arranged about the Thames, which constitutes its port,

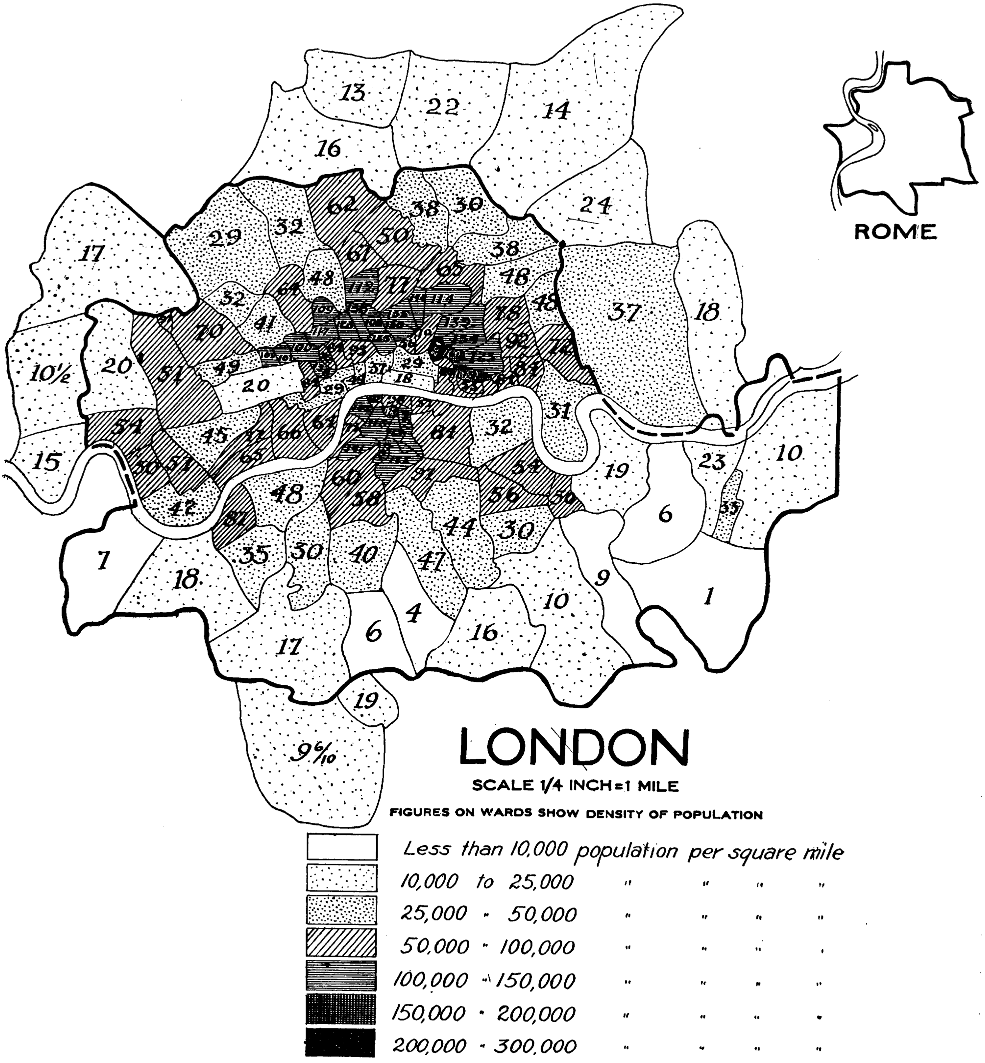

Fig. 9

the greatest port in the world. Fairly in the center of the whole are the three districts of London City, All Hallows Barking, St. Botolph and St. Sepulchre, with 18,000, 29,000 and 37,000 people to the square mile, appropriate to the heart of the city. In any direction but west one may go off four or even five miles across the denser rings before districts so thinly settled will be encountered. Only in the direction of the appropriately named Westminster is a line of continuous thin settlement into the aristocratic West End, through the Strand, Martin's in the Fields and Mayfair and Knights with but 20,000, as its area is largely taken up by Hyde Park and Kensington Gardens. This strip contains a good part of London's show places. But close at hand in the opposite direction is the East London that Besant describes as a city of 2,000,000 without hotel, restaurant, bookshop or newspaper. Densest in Stepney are Spitalfields, Mile End New Town and St. George North, all with over 150,000. Thence again a mile-broad band with more than 100,000 springs around through the northwestward to Hyde Park. How familiar they sound, these district names in London's denser band: Bethnal Green, Haggerstown, Hoxtons, City Road, Goswell Street, Clerkenwell, Somerstown, Gray's Inn Lane, Tottenham Court, St. Anne Soho, All Souls, Rectory and St. Mary in Marylebone! Across the river from the City, too, the density at the shore is low in St. Saviour's and St. Olave, Southwark, 58,000 and 51,000 to the mile, but at once rises to 174,000 in Borough Road, while a considerable area of 100,000 stretches to Camberwell and into Lambeth. Thence the population thins again.

Barely three square miles of the city's center seem to feel the pressure from without that thins, but the city's "urban" population bursts beyond the County limits into Essex, Middlesex and Surrey. The heavy line on Figure 9 bounds the county of London. Beyond this have been included all districts in the surrounding counties that have a population density above 10,000 to the square mile continuous with such a population within. There can be little to add here, to subtract nothing. This city, the anthropographic London, contained, in 1901, 5,327,000 people on 139 square miles of territory and was growing at the rate of about 65,000 per year. Not merely is the City diminishing, but the central fifth of the whole area shows a loss of inhabitants in the decade preceding 1901, shops, public and office buildings steadily taking the place of dwellings.

On the border of the map of London has been placed the outline of old Rome of the Aurelian Wall. There is nothing inferred in either diagram. Both represent matters of fact and measurement. The reader may fill in the density shade of Rome to suit himself and add suburbs as he likes. The scale of all the drawings is the same.

Something has been said above about the rate of increase of

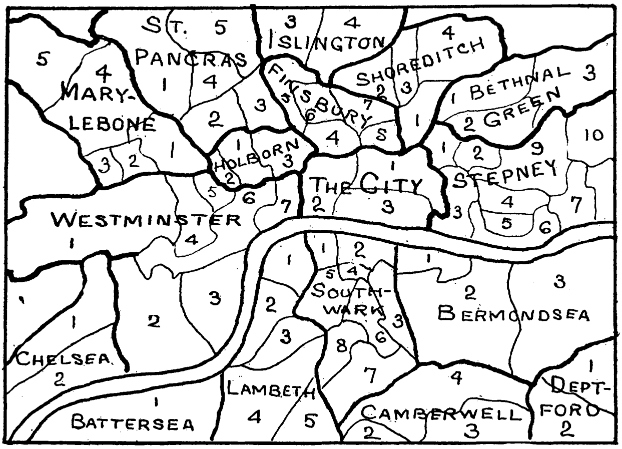

FIG. 10.—REGISTRATION DISTRICTS, CENTRAL LONDON.

Marylebone
1 All Souls
2 Rectory
3 St. Mary
4 Christchurch
5 St. John

St. Pancras
1 Regent's Park
2 Tottenham Court
3 Gray's Inn Lane
4 Somerstown
5 Camden Town

Islington
3 Barnsbury
4 Islington S. E.

Shoreditch
1 Shoreditch South
2 Hoxton New Town
3 Hoxton Old Town
4 Haggerstown

Finsbury
4 St. James Clerkenwell
5 Amwell
6 Goswell St.
7 City Road
8 Finsbury

Bethnal Green
1 B. G. North
2 " South
3 " East

Westminster
1 Mayfair & Knights
2 Belgrave
3 St. Margaret & St. John
4 St. James, Westminster
5 St. Anne, Soho
6 St. Martin in the Fields
7 Strand

Holborn
1 Bloomsbury St. Giles, S.
2 St. Giles, N.
3 Holborn

Chelsea
1 North Chelsea
2 South "

The City
1 St. Botolph
2 St. Sepulchre
3 All Hallows, Barking

Lambeth
1 Waterloo Road
2 Lambeth Church 1st
3 " " 2nd
4 Kennington 1st
5 " 2nd

Stepney
1 Spitalfields
2 Mile End New Town
3 Goodmans Fields
4 St. George, N.
5 St. John
6 Shadwell
7 Ratcliff
9 Mile End Old Town West
10 " " " " East

Battersea
E. Battersea

Bermondsea
1 St. Olave, Southwark
2 Bermondsey
3 Rotherhithe

Camberwell
2 Camberwell
3 Peckham
4 St. George

Deptford
1 Deptford North
2 " Central

Southwark
1 Christchurch Southwark
2 St. Saviour Southwark
3 Kent Road
4 Borough Road
5 London Road
6 Trinity Newington
7 St. Peter, Walworth
8 St. Mary, Newington

some of the cities studied. As official estimates of population of all of them have been made about 1906 or 1907, I have used the ratio between the earlier and later figures and that between the official and the anthropographic numbers to estimate an approximate rate of increase. The results and estimates for the date 1905 are appended here.

TABLE IX.

	ANTHROPOGRAPHIC CITIES.				
CITY.	AREA, MILES.	POPULATION.	ANNUAL INCREASE.	POPULATION 1905.	PER SQ. MILE.
London......	1901...139	5,327,000	65,000	5,581,000	40,000
New York...	1900... 72	3,636,000	119,200	4,232,000	59,000
Paris......	1896... 44	2,874,000	33,000	3,173,000	72,000
Berlin.......	1905... 44	......	27,700	2,584,000	59,000
Vienna......	1900... 48	1,600,000	35,000	1,775,000	37,000
Chicago.....	1900... 72	1,500,000	51,700	1,758,000	24,000
Philadelphia.	1900... 38	1,142,000	26,200	1,273,000	33,500
Boston......	1900... 27	681,000	15,000	756,000	28,000
St. Louis....	1900... 24	575,000	10,700	554,000	23,000

The method of estimating the annual increase is very crude, yet the writer believes it is within one or two thousand of the truth. If the values were projected forward to 1910 we should get so far away from our base of facts that they would merit much less confidence. The above values are presented as the first series of comparable ones worked out. The singularly rapid growth of New York is apparent at once. If the rates remained constant it would have the same population as London in 1930.

BERNHARD HANTZSCH'S NOTES ON NORTHEASTERN LABRADOR.*

BY

ROBERT STEIN.

Works that give a clear picture of the face which nature wears in Arctic lands and seas are none too numerous, and hence are hailed with special satisfaction. When informed that on one of the Peary expeditions over 400 musk oxen were shot, most people ask in astonishment: What do these animals feed on? It takes some time to make them understand that the total of 400 was made up of small herds distributed over a country as large as Ireland. But what do they live on during the winter, when the snow covers everything? Great is the average reader's astonishment on learning that, on

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* Beiträge zur Kenntniss des nordöstlichsten Labradors. Von Bernhard Hantzsch. *Mitteilungen des Vereins für Erdkunde zu Dresden.* Heft 8. Dresden, 1909. Pages 169–229.